MARINE REVIEW.

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Lake Freight Matters—Signs of Improvement.

Estimates on ore contracts, full and partial season charters, place the aggregate, exclusive of ore to be carried by the boats of the mining companies, at about 1,750,000 tons. This is all ore to come from Ashland, Two Harbors and Marquette, as the only Escanaba contract of which there is yet any knowledge is the transaction between the Pewabic company and Milwaukee vessel owners, reported some time ago at 85 cents. Of this million and three-quarters covered from Lake Superior, about 350,000 tons, distributed among several owners, represents the bulk of the sale of 400,000 tons made to the Carnegie Steel Company; 240,000 is Two Harbors ore placed at $1.05 for the season, and 200,000 tons is to be carried from Ashland at $1 by the American Steel Barge Company's whalebacks, which have, by the way, a season capacity of about 800,000 tons. The best contracts made, from the vessel owners' standpoint, are one for a pair of barges to run light to Marquette $1.05, a few blocks from Ashland expiring Aug. 10 and a liberal amount of Two Harbors and Ashland business at $1.05 for the season. About 300,000 tons of soft coal to go the head of Lake Superior from Ohio ports has been taken by Cleveland and Detroit owners at 45 cents a ton.

Although there is no improvement of note in the pig iron market, and no signs of a disposition on the part of furnace men to buy ore more freely, developments of the past few days are somewhat favorable to the vessel interests, and owners who have not accepted low contract freights are given encouragement in the belief that going rates will rule higher. The fact that going rates have already shown improvement, notwithstanding a reduction in shipments from Ashland and a supply of wild tonnage much larger than in previous years, notably through the bulk of the whaleback fleet being free to take single trip charters, is strong evidence of the very large amount of freight to be moved outside of the ore trade. Still, ore shippers are not warranted in maklng more season contracts, even at the rates established two weeks ago. There has been some talk of $1.10 on contracts from the head of Lake Superior, but it is probably prompted by the efforts of representatives of Missabe mines to cover for the season some ore that must be carried largely in October and November, on account of delays in moving ore from the new range. In the matter of lake freights the Missabe companies will be at a disadvantage, as the bulk of their ore will come in during the late months of the season, when freight rates usually rule high, but they are not meeting with sympathy from representatives of mines on the older ranges, who blame the promoters of the new district for bringing on the present low prices of ore, by overdrawn statements as to the 1893 product. But then, the Missabe operators couid not get money to develop the new properties without extravigant statements as to shipments, and the influence of the range on the market for the present season has been discounted. One block of about 85,000 tons of this ore, of which more than half cannot be shipped until October and November, has been offered to vessels for several days past, but it will not, of course, be accepted at the rates governing contracts that provide about an equal amount to be carried during each month of the season.

The New Light Ships.

A letter to the REVIEW from Secretary Keep, dated Buffalo, the 24th inst, says: "I am this day in receipt of a letter from the light-house board giving some information of interest to vessel owners. This letter was received in response to a letter of inquiry directed to the board asking for information as to the time when the light-ships now building would go into service; also asking whether the board had definitely determined where the new light-ships would be placed. The answer of the board is as follows: The Detroit river light-ships are due to be completed under the contract on June 11, 1893. The Bar point light-ship and the three light-ships that are being built with the Eleven-foot shoal appropriation are due to be completed according to the contract on July 29, 1893. They will go into service as soon as practicable after these dates. The board will locate the new light-ships as follows: One of the Detroit light-ships at Ballard's reef, and the other two at the Lime-Kiln Crossing. The Bar point light-ship will be located near the present private light-ship at Bar point, and the three light-ships built from the Eleven-foot shoal appropriation will be located as follows: One near Corona shoal, Green bay, to be called Corona shoal light-ship; one near Northwest shoal, foot of Lake Huron, to be called the Lake Huron light-ship; one near Poe's reef, Straits of Mackinaw, to be called the Poe reef light-ship. Tee board states that it will not desire to renew its contract for the Lime-Kiln Crossing and Ballard's reef lights after June 30, and that it will endeavor to do what appears to be its duty with regard to the maintenance of these lights after the last named date."

The Christopher Columbus.

Now that the big world's fair steamer Christopher Columbus is in service at Chicago, readers of the REVIEW will, of course, be more interested in the power developed by the machinery of the famous boat and in her speed, than in an extended description of the steamer, which has already been written about at great length. It is not probable that any effort to secure maximum speed was made on the first trip. Indicator cards taken from the engines during a short run on Lake Michigan, and which will be published next week, show a total indicated horse power of 2,637.6, with 155 pounds steam, 25 inches vacuum and 108 revolutions. The engines worked smoothly and will no doubt indicate 3,000 horse power with maximum steam pressure and cut off. They were built by Samuel F. Hodge & Co., Detroit, and the cylinders are 26, 42 and 70 inches by 42 inches stroke.

A correspondent who was aboard the boat on the trip to Chicago writes us that for the first twenty-four hours out on Lake Superior the boat averaged fifteen miles an hour with seventy revolutions and 100 pounds of steam. The balance of the run to Point Iroquois was through a heavy sea and the boat behaved excellently. The engines were not stopped during the entire run of Lake Superior. Detour to Mackinac island was made at an average speed of sixteen miles, with seventy-six revolutions and 110 pounds of steam. At one point on Lake Michigan it was claimed that eighteen miles an hour was reached on higher steam and a marked increase in the number of revolutions. Capt. McDougall, Superintendent Kidd of the barge company's ship yard, Chief Engineer R. S. Blauvelt, Mechanical Engineer W. L. Mahon, Draughtsmen Frank Hayes and S. G. Stevens and Electrician G. E. Jamme, as well as Howard F. Sprague, marine artist, and a number of newspaper men and friends of Capt. McDougall, were among the guests on the trip. The chief officers of the boat are John McArthur, captain; Alexander E. McGregor, first officer; R. E. Ritchie, first mate; Geo. R. McPherson, second mate; Robert Armstrong, chief engineer, and Geo. A. Dingmark and John Eagan assistant engineers. The boat will be classed by the American Shipmasters' Association.

Yachting at the Fair—A Lake Association.

In a letter printed herewith, Commodore Robt. Rae of the yacht club, Chi ago, reviews the efforts of the club to prepare for the entertainment of visiting yachtsmen and the care of their yachts while attending the World's Columbian Exposition. The letter will prove decidedly interesting to owners of yachts in all parts of the lakes, as it not only indicates a great degree of success on the part of the Chicago gentlemen who have undertaken preparations on an elaborate scale for a big gathering of yachtsmen at the fair, but also outlines plans for a permanent association on the lakes that may be made superior to anything of its kind in this country. The letter follows :

EDITOR MARINE REVIEW :—Your issue of May 11 has an article under the head of "Yachts at the Fair," stating that the schemes for a club house, anchorage grounds and additional breakwaters for visiting yachts to the World's Columbian Exposition, do not seem to be maturing very rapidly. This statement, literally taken, is quite correct. They do not seem to be maturing very rapidly, yet I beg leave to state to you that they are maturing just as rapidly as the routine of the government departments will permit.

The secretary of war issued a license last September to the yacht club to make breakwaters, but as the lake front case was pending in the supreme court and about to be decided, the license provided that in case the supreme court held that the submerged lands did not belong to the federal government but to the state of Illinois, that in such an event, the club would be required as a precedent to erecting the breakwaters, to obtain the consent of the state of Illinois, the city of Chicago and the World's Fair Exposition, it having a grant from the state of the submerged lands for the period of the year of the fair. The yacht club desired to obtain possession of East End park, of the value of about $500,000, belonging to the city, as part of its yachting accommodations and for the use of the Naval Academy. This park has a frontage on the lake of 1,000 feet, and is immediately north of and adjacent to the world's fair, and affords a private entrance to the fair grounds for the use of yachtmen. It was found necessary to apply to the city council to get accession of this park, and also the consent required by the United States license to build the breakwaters.

We all know the delays in getting a matter through a municipal legislative body. The club, however, obtained the rights it required from the city, by an ordinance passed on the 20th of March, 1893, and then following up the requirements of the license, applied to the state of Illinois for appropriate legislation, giving its consent to the proposed improvement. This was obtained in less than thirty days from the date of the passage of the ordinance. It became a law on the 18th of April, 1893. Immediately upon its passage, the world's fair people by a formal resolution, gave consent, so that all the conditions of the license were complied with. The secretary of war required that the United States engineer in charge of the port of Chicago should approve the plans and specifications, but required that they should be first made and deposited with the department, together with the certified copies of the resolutions of the state of Illinois, the city of Chicago and the resolutions of the World's Fair Exposition. The commodore of the club within three days after the passage of the joint resolutions of the legislature of the state of Illinois, went to Washington and saw the president and secretary of war, and received a promise from them that everything should be done as speedily as consistent with the routine of their office. The United States engineer was instructed by telegram to proceed to make the necessary plans and specifications with the utmost celerity. Yesterday they were completed and today they are to be forwarded

THE MERLE OF BUFFALO.

to Washington for the approval of the department. So soon as this is received, the work will immediately be commenced upon the breakwaters.

As to the Naval Academy, everything is being done to get ready by the first of August for the visiting yachts. Piers are being made and the sloughs in the park are being filled up as rapidly as the work can be done; the filling alone costing something over $12,000. It is proposed on the 1st of June if possible, to inaugurate the Naval Academy by a meeting on the grounds of the state and municipal authorities, the world's fair commissioners and directors of the World's Fair Exposition, and such members of the cabinet of the United States as can attend, and the regents of the academy, both state and domestic, and the Right Rev. Bishop McLaren of the Episcopal church of the state of Illinois, will deliver an appropriate oration.

The men of wealth that you refer to who have given their sanction to this benevolent enterprise, have stood ready to subscribe with alacrity and liberality, to its inauguration. It will be actually necessary to make these breakwaters off Jackson park, not completely made but sufficiently made to secure smooth water for a sufficient lee for yachts visiting the world's fair by the first of August. It is utterly impracticable for any gentleman owning a yacht of value to moor in the Chicago river or the lake front basin. The water is filthy and the decks and the spread of canvas would be utterly ruined by the bombardment of soot and cinders and dust that would come from the city. Clear water and atmosphere are an actual necessity to preserve the hull and sails of a beautiful yacht. The engineer in charge of the improvement off Jackson park has devised a means whereby he can secure smooth water for harboring at least 300 yachts by the first of August. The work will be pushed with ample means and unremitting labor required to make it a complete success and a thing of adornment to the city, but the breakwaters cannot be completed before three years and perhaps more. Just so soon as the government approves the plans and there is in the treasury enough money to insure fair accommodations for first class yachts, the yacht club will issue a formal invitation to these yachts to visit Chicago and will be responsible for their safe and convenient entertainment. The yacht club from the first advised against, and deprecated the issuing by the world's fair people, invitations to foreign and domestic yachts to visit the world's fair, without seeing to it that the yachts so visiting were, while at this port, protected in their hulls and sails from the damage done by dirty water and a thick smoky atmosphere. The yacht club is not responsible for such an invitation, but when the way is clear to invite guests and a banquet provided for them and a bed in which they may rest with safety and comfort while visiting us, the invitation will issue, and not until then. The yacht club is thoroughly conscious that it can accomplish little or nothing without the aid of every yachtman around the lakes; not only their financial aid, but their intelligent sympathy and advice. The yachtmen around the lakes, not residing at Chicago, must regard the investment made at Chicago by them for their accommodation, as a permanent investment, where they can, in the fu'ure, come as an attraction, to the metropolitan city of the lakes and lull there for such time as may suit their convenience and pleasure. It is the purpose of the yacht club to make its houses and grounds the houses and grounds of every yachtman on the lakes, and by a reciprocity we can have a yachting association on the lakes superior to anything that now exists on the ocean.

Three new yachts have already been entered and an order is now being made by General Joseph T. Torrence for a torpedo boat to cost not less than $150,000. The general also made a handsome subscription to the Naval Academy. The yachtmen of Chicago would like the yachtmen of the lakes to make some sort of an arrangement to meet at some place on the lakes on the Fourth of July next to consider the whole subject of yachting on the lakes. Will you kindly, through y ur influential paper, give every aid you can to bring about so desirable a result as that of a yachting association of the lakes.

The Yacht Club, ROBERT RAE,
Chicago, May 17, 1893. Commodore of the The Yacht Club.

One of the English Racers.

A writer in Fairplay of London says of the Calluna, one of the cutters just completed on the Clyde for a syndicate of Britishers who are planing on wrestling the palm from American yachtsmen: "The Calluna is a fine vessel, but thoughly calculated to shock the ideas of the men whose notions of yacht building date, we will say, from twenty years back. Roughly speaking, and taking a side-view of her, the Calluna would represent a triangle, of which the apex formed the lowest point of the keel, and the flat surface above, the run of the deck. She is a fine boat with an enormous beam, and calculated, one would say, to ensure the maximum of speed. The old idea of deep draught boats, or what I believe is called deep-displacement, has gradually been knocked out of the heads of English yacht builders by their American competitors. The Calluna has not a centre-board or sliding-keel, but she has a fixed keel which goes about as far down into the ocean as any respectable centre-board could be expected to go."

Referring also to the Valkyrie and the Prince of Wales's cutter Britannia, the same author says: "Thanks to the enterprise of the Prince of Wales, Lord Dunraven, and others, racing is likely once more to come back to the old 90 or 100-ton class of boat. The little toys are all very well in their way, but they are toys, and nothing more. There is no reason why these racing boats, if their spars were reduced, should not be converted into good comfortable weatherly cruisers. There is objection to them on this score from the difficulty of docking them, and a triangle resting on an apex is not exactly a comfortable thing to put on shore. This inconvenience may prevent the model from being generally adopted for cruising purposes."

Cleveland and Buffalo Yacht Clubs.

The yacht Merle, an engraving of which appears in connection with some yachting news on these pages, is a Burgess model and is owned by Commodore J. F. Hower of the Buffalo yacht club. Chicago is not the only point on the lakes at which a substantial interest in yachting is now shown. The prosperous clubs of Detroit and Toledo are to have strong rivals in the Buffalo association, which is now putting the finishing touches to an elegant club house, and the Cleveland club, now capitalized at $10,000, has authorized its secretary to apply for an increase of capital to $25,000, and has begun work on a $10,000-club house on the lake front, to be completed this fall. We are indebted to Mr. Harry Gardner for the engraving of the yacht Merle.

Elevator Capacity at Buffalo—Lake Carriers' Matters.

Special Correspondence to the MARINE REVIEW.

BUFFALO, N. Y., May 25.—Spite of all outside comment to the contrary, it is dawning upon us that this port has not enough elevator capacity. This has become so apparant that a company has been started that will build a 1,500,000-bushel house if those precious guardians of the city's welfare, and of their own personal ends, the city aldermen, conclude to grant it railroad connections. The spectacle of a needed improvement being blocked because the alderman of the ward hasn't been properly "influoenced" has confronted us for some time. The railroads are still holding aloof and refusing to give up a bushel of room to any grain not consigued through by rail, though they have plenty of it. The slow sale of grain makes it for once prefer canal shipment, and yet the fleet has been starved so many years that it is not a third of the size that it should and would be if boats could be built in a day. This situation, with canal elevators full and a big fleet waiting, has pushed canal rates up to 5 cents on wheat to New York and set the boatmen laughing. Frank Beadle's tow of six, that carries 47,000 bushels of wheat and makes New York in nine days, is a small gold mine at this rate.

The membership of the Lake Carriers' Assoctation is now 606,493 tons, which is a very neat figure and means a power wherever it moves. Blanks are being sent out to such owners as are thought likely to join, and after due time is given them to come in the books will be closed. It is thought that 15,000 tons more will come in.

Nothing has been heard yet from Gen. Alger's office in Detroit, in regard to a meeting of the committees on the raft-towing question. It was asked by the vessel side that a meeting be held this week, but so far as appears Gen. Alger is still in California and it is requested that he be given two weeks to get ready in when he returns. It looks as though the question would hardly be settled this season.

Naval Notes.

Special Correspondence to the MARINE REVIEW.

WASHINGTON, D. C., May 25.—As Commodore George Dewey, chief of the bureau of equipment, has accepted the detail of member of the light-house board, to succeed Commodore Gillis, retired, some more changes are made necessary in the navy. It is probable that Capt. Matthews, now conducting a special investigation into the administration of the Mare Island navy yard in California, will be appointed to succeed Mr. Dewey. Pending Capt. Matthews return from San Francisco, Commodore Dewey will continue to look after the bureau in addition to his new duties on the light-house board.

Designs for the three gunboats authorized by the last Congress have been completed by the bureau of construction and repair, and all that is necessary for issuing the advestisements is the approval by the secretary. They will all be of the twin-screw type, two to be of composite construction for general service, and one to be of steel for special service in Chinese island waters. This decision disposes of the proposition for one of the boats to be a paddle-wheeler. On the Asiatic station, these boats, which are to be of about 1,200 tons displacement and light draft, will be of value, as they will be able to ascend far up the rivers where American interests have been several times jeopardized in recent years and the government powerless to protect them on account of the draught of our naval ships.

Although it is not generally known, Secretary Herbert has authority to construct four third class torpedo boats for the armored cruiser Maine and battle ship Texas, and will pass upon plans for them shortly. These tiny destroyers, which are to be 60 feet long, will be built at the navy yards in New York and Norfolk. The two boats for the Texas will have a displacement of something like 7½ tons, while those for the Maine will have about 11 tons displacement. The horse power will be 200 in the Maine and 150 in the Texas, and the latest discoveries in metallurgy will be used in the machinery. It is proposed to develop a horse power in these boats with 60 pounds of machinery. Nearly 700 revolutions a minute will be made. The engines will be of the quadruple type and the boilers will, of course, be tubulous. A speed of about 17 knots is expected from them.

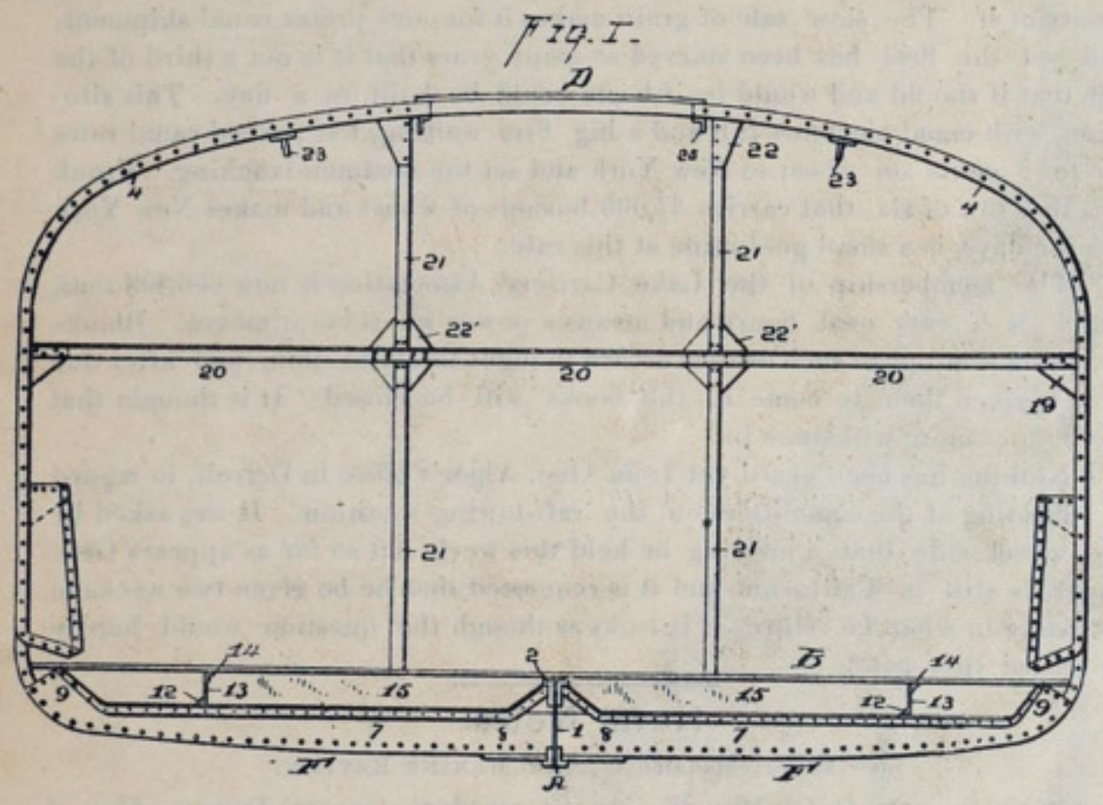
Capt. Alex. McDougall's Patents.*

FRAME WORK FOR VESSELS—SPECIFICATION FORMING PART OF LETTERS PATENT NO. 456,586, DATED JULY 28, 1891 —APPLICATION FILED APRIL 19, 1890.—NO MODEL.

"The invention relates to an improved frame work for vessels" says the inventor "and more particularly the vessels patented by me. The objects are to provide a frame work which will be very strong and rigid and at the same time simple and capable of being set up easily. The principal novelties consist in a number of continuous frames or ribs extending at right angles to the keelson and ranging from one extreme end of the vessel to the other extreme end, a number of longitudinal frames extending from bow to stern and which strengthen the frame work longitudinally, and a number of lateral frames or braces which strengthen the frame work against lateral pressure. Fig. 1 is an elevation of one of the continuous frames or ribs, showing the lateral braces in position; Fig. 2, a side elevation of the keelson with the continuous frames or ribs in section; Fig. 3, an enlarged sectional view of the keelson, illustrating the manner of attaching the continuous frames thereto; Fig. 4, an interior view of the frame work completed; Figs. 5, 6, 7, 8 and 9, detached views illustrating different details of the frame work.

"The preferable dimensions of the vessel are 260 feet in length, 36 feet in width and 22 feet in depth. In building the frame work the first thing to be done is to lay the keelson A on the usual stocks or ways. It has been found that the preferable

Fig. 1.



manner of launching the vessel is from the side, instead of from either end as is now practiced, for the reason that the vessel has no keel and is practically flat on the bottom. The keelson is therefore laid so as to be broadside to the water, and is wedged up, in short, on short inclined ways. This keelson (see Fig. 3) is composed of a plate 1, having angle irons 2 2 2 2 bolted to its top and bottom at each side and extending the entire length of the keelson, so as to strengthen the same. These angle irons are each provided along its outer edge with a line of bolt holes 3 3. The transverse frames or ribs 4 4 4 of the vessel are each composed for the greater part of two angle irons 5 and 6, bolted together as shown in Fig. 5, so as to be very light and strong. At the point where the frames or ribs begin to curve inwardly to form the bottom, the two angle irons 5 and 6 are separated and the upper angle 6 is bent inwardly to form an angle, as shown. The lower angle iron 5 continues along the bottom, and is bolted to one of the lower angle irons 2 2 of the keelson. At the bottom part of the frame work the lower angle iron 5 is re-enforced by means of a metallic plate 7, which is bolted to said angle piece. The plate 7 is widened at its inner end, as at 8; so as to fit between the angle irons 2 2 of the keelson. An angle iron 9 is bolted to the upper edge of the metallic plate 7, so as to strengthen the same, and the inner end of this angle-iron 9 is bolted to the upper angle iron 2 of the keelson. In this way it will be evident that the continuous frames are secured in place to the keelson both at the top and bottom of the same, and by being provided with the strengthening plates 7 7 the frame work at the bottom will be very strong and rigid. The plates 7 are also widened at their outer ends, as shown at 9, to correspond with the portion 8. Along the outer edges of the plates 7, on each side, is bolted a short angle iron 10, to which in turn is bolted a long metallic strip 11, extending from the beginning of the bow portion. The construction of the bow and stern transverse frames differs from that of the amidships portion, as will be described presently. The strip 11 is bent over at its upper edge, as shown, and this

Fig. 2.

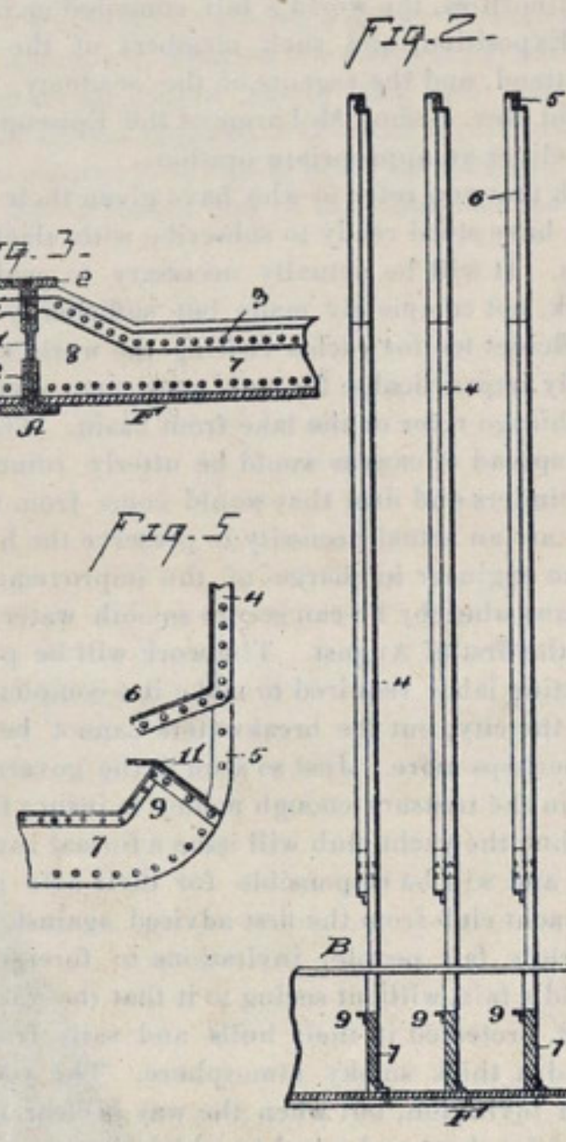


Fig. 3.

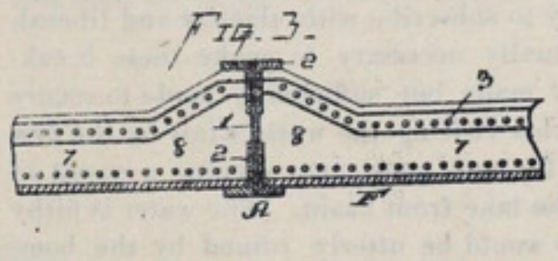


Fig. 5

Fig. 7.

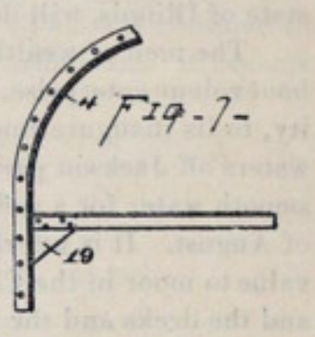


Fig. 8.

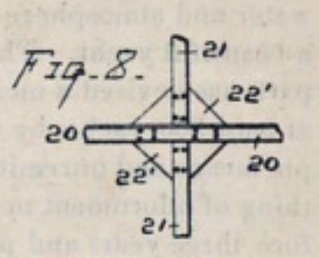
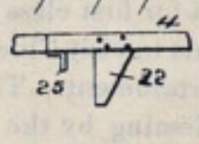
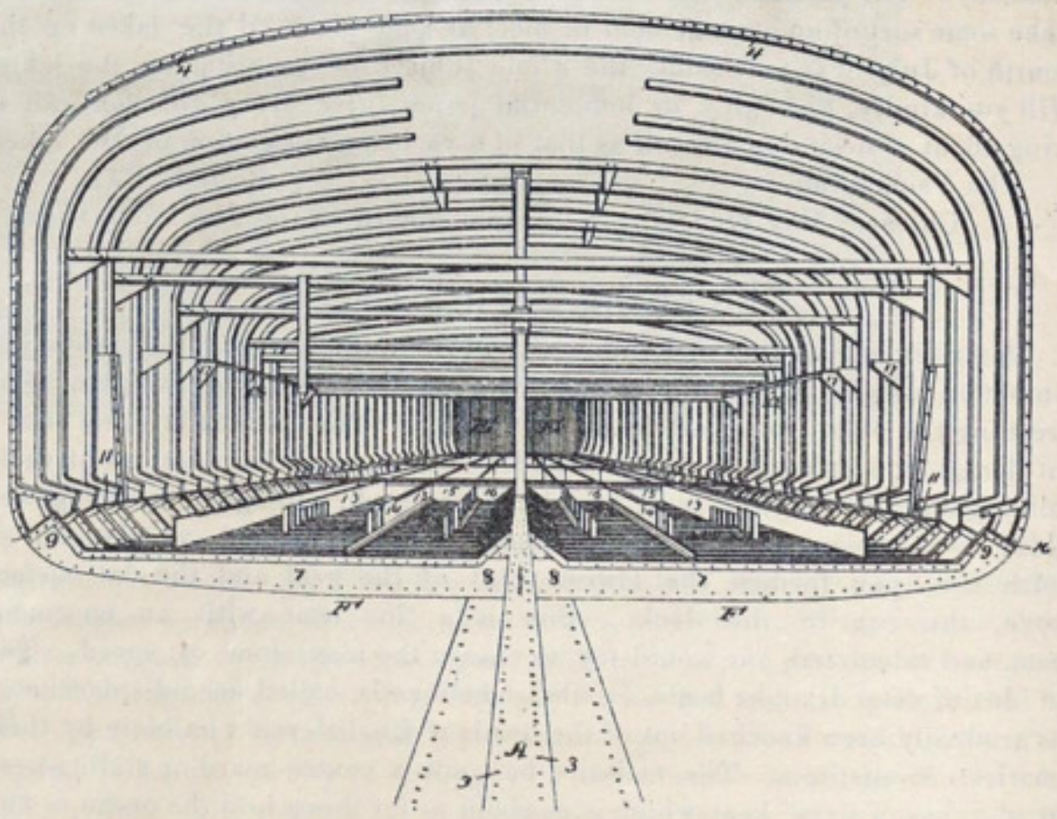


Fig. 9.



portion is provided with a line of bolt-holes all along. The bent-in portions of the angle iron 6 may be bolted to the strip 11 or to the angle iron 9. At suitable points on top of the angle irons 9 a number of angle irons 12 are bolted in position extending longitudinally and parallel with the keelson. To each of these angle irons 12 is bolted a plate 13, which is provided at its upper end with an angle iron 14. It is preferable to make use of about four of these lines of plates 13 on each side of the keelson, so as to further strengthen the frame work at the bottom, where the greatest strength is necessary. At suitable intervals a number of plates 15 are bolted to the top of the angle irons 9, and extend parallel therewith at right angles to the plate 13. The plates 15 are each provided with an angle iron 16 along its upper edge

Fig. 4.



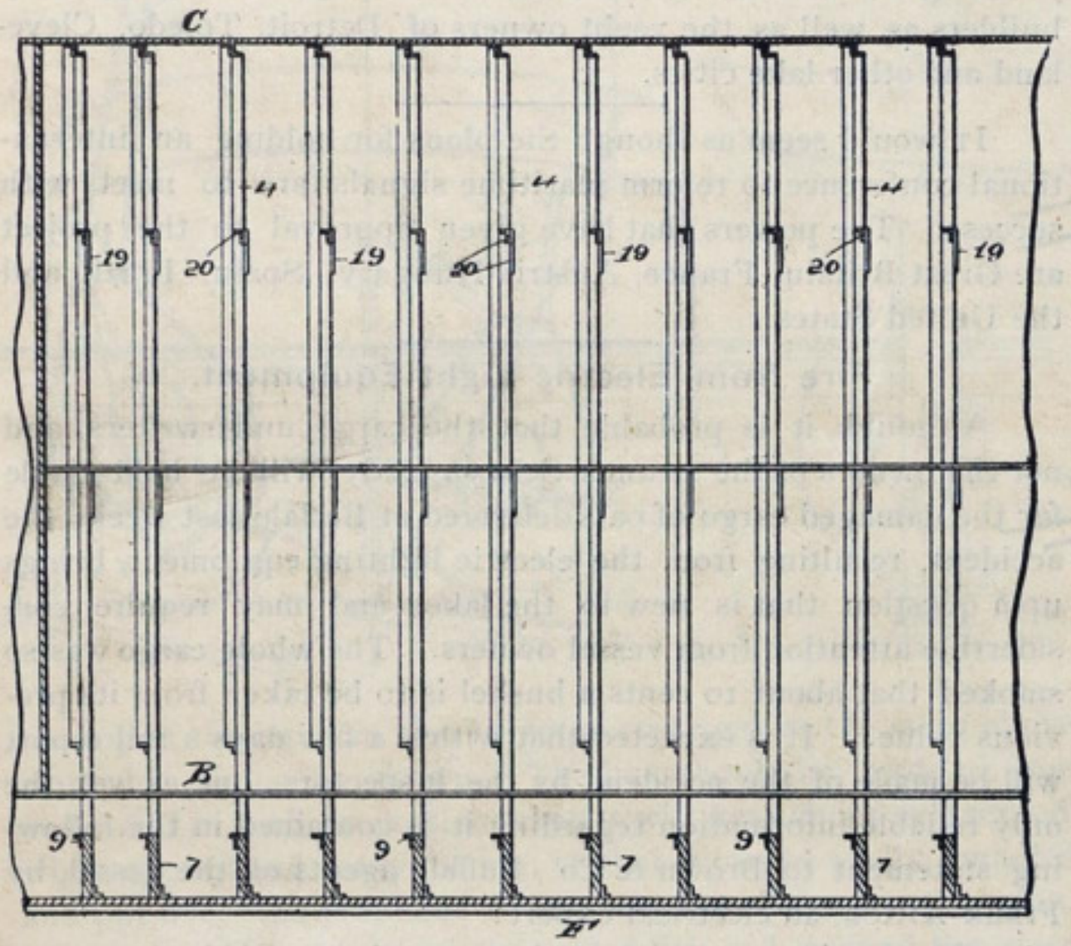
corresponding with the iron 14. On top of the angle irons 14 and 16 and to the flanged section of the strip 11 is bolted a metallic floor B, composed of a number of thin plates. The floor B forms the bottom of the hold of the vessel, and it materially serves to strengthen the frame work. When the bottom plates are in position, the space between the same and the floor F con-

*Under this heading we will publish specifications accompanying letters patent granted to Alexander McDougall since his first application for a patent on the whale-back type of vessel May 1, 1880.

stitutes a water bottom, the functions and advantages of which are fully set forth in my application serially numbered 311,991.

"To prevent the transverse frames from spreading while being erected, before the plating is in position, and also to strengthen the hull longitudinally, I make use of a metalic strip 18 on each side. Each of these strips is bolted or riveted to a number of brackets 17 17, secured in place by riveting or otherwise to the transverse frames, preferably to alternate frames. These strengthening strips 18 18 are located about one-third of the depth of the vessel from the bottom. It is a good arrangement to extend some of the plates 7 entirely around the curve of the bottom and up the sides as far as the brackets 17, and also to extend the angle irons 9 9 to the same point. With this arrangement the top of the plates 7 will serve the place of the brackets 17 17, and the transverse frames will be materially strengthened. The brackets are preferably held in place by the same bolts or rivets which hold the two angle irons 5 and 6 together. Still further up, at the point where the transverse frames begin to curve to form the deck or top, are secured corresponding brackets 19, held in place identically like the brackets 17 17. These two sets of brackets are connected by means of angle irons or T irons, 20, which extend directly across the interior of the vessel. These connecting braces extend across the

Fig. 6.



hold only at alternate frames, and they form the base of the arch of the deck, so that the deck cannot spread or flatten under the weight of the waves or merchandise. To farther strengthen and support the deck, upright braces 21 21 are used. These braces are riveted or bolted to brackets 22, secured to the transverse frames near the top and corresponding with the brackets 18 and 19. The lower end of the braces 21 are secured in some suitable way to the floor B, or else they are bolted or riveted to the plates 13 13 and pass down through suitable openings in the floor B. These braces 21 are rendered more rigid by being bolted or riveted to brackets 22′ 22′, which are secured to the cross- braces 20. On the outside of each line of upright braces 21 is a line of double angle irons or T irons 23, which are bolted or riveted to the under side of the transverse frames, and which also contribute to the lateral strength of the frame work.

"Entrance to the hull is afforded by means of suitable hatchways cut into the upper deck, and it is therefore possible to extend some of the transverse frames only as far as the edges of these hatchways, as will be evident from Fig. 1. The ends of the transverse frames at these points are strengthened and supported by means of an angle iron 22, bolted or riveted near the upright braces 21 21. When the outer plates C are in position, the edges of the same at the hatchways are strengthened by means of an angle iron 25, extending entirely around the same. The plating is further strengthened by means of the hatch D itself when in position. At the points where the frames begin to curve inwardly to form the bow and stern portions, is placed a diaphragm or partition E, which is composed, preferably, of a thin metallic plate bolted or riveted to the interior flange of one of the transverse frames. These partitions divide the hold of the vessel from the bow and stern portions. The plates 7 7 and 13 13 and 15 15, strips 11 11, and floor B are made use of only in the space between the two partitions. At the bow and stern portions the transverse frames are composed entirely of two angle irons 5 and 6, and the attachments to the keelson consists in bolting or riveting the angle iron 6 to the lower angle iron 2 of the keelson.

"The horizontal connecting-braces 20 20 are used within the bow and stern portions, and form convenient beams to which a metallic floor B is riveted. The space beneath this floor is used as a water tank, as explained in my application serially numbered 311,991, and the space above the same at the stern is used as a cabin for the officers and cook, and at the bow this space is used as a forecastle for the crew. These floors B also strengthen the bow and stern portions materially. The upright braces 21 21 extend only in the hold portion of the vessel, but the longitudinal braces 18 18 and 23 23 are made use of also in the bow and stern sections.

"What I claim as new and desire to secure by letters patent is: First—In an improved frame work for metallic vessels, the combination of the keelson A, continuous transverse frames 4, secured at their ends to said keelson and consisting of angle irons, re-enforcing plates 7 7, secured to said transverse frames, angle irons secured to the upper ends of said re-enforcing plates. upright metal plates 13 15, secured to said angle irons, and a floor B, secured to said plates. Second—In an improved frame work for metallic vessels, the combination of the keelson A, continuous transverse frames 4, secured at their ends to said keelson and consisting of angle irons, re-enforcing plates 7 7, secured to said transverse frames at the bottom portion of the vessel and perforated for the purposes mentioned, angle irons secured to the upper ends of said re-enforcing plates, upright metal plates 13 15, secured to said angle irons, and the floor B, secured to said upright metal plates, substantially as set forth. Third—In a metal frame-work for vessels, the combination of the keelson A, the continuous frames 4, secured at their ends to said keelson, re-enforcing plates 7 7, secured to said transverse frames and perforated for the purposes mentioned, angle irons secured to the upper ends of said re-enforcing plates 7 7, upright metal plates 13 15, secured to said angle irons, angle irons at the upper ends of said upright plates 13 15, and a metallic floor B, bolted to the last mentioned angle irons, substantially as set forth. Fourth—In an improved frame work for metallic vessels, the combination of the keelson A, continuous transverse frames 4, secured at their ends to said keelson and arched at their upper ends to form the curve of the deck, and cross frames connecting said transverse frames at the base of the arch, substantially set forth."

Personal Mention.

W. McKinley and A. E. Humphrey, who are among leading stockholders in iron mining companies of the Missabe range, spent a few days of the past week in Cleveland.

An association of foundrymen will be formed in Chicago this week. Mr. A. I. Finley, editor of the Iron Trade Review of Cleveland, has given considerable attention to work preparatory to this meeting, and has made foundry and machine shop matters an additional feature of interest in the Iron Trade Review. In fact, editorial work on that journal has shown marked progress under his direction during the past year.

Trade Notes.

The American three-masted schooners Clytie, Lizzie May and S. C. Tryon, American ship Vigilant, American screw steamer Anthony Groves, Jr., British schooner Daniel Simmons and British brig Marianna Pepe were all classed, during the past week in the Record of American and Foreign Shipping, published by the American Shipmasters' Association of New York.

A patent steering apparatus which is attracting considerable favorable attention among vessel men in the east has lately been applied to some lake vessels with considerable satisfaction. The principal novelty consists in the use of an internal gear system, which seems to give great power and strength. The American Steel Barge Company has adopted the machine on a number of its whalebacks, and they have also been supplied to several tugs and passenger steamers at Bay City, Duluth, Saginaw and Sault St. Marie. Mr. H. M. Hanna of Cleveland has the apparatus on his fine yacht Comanche. Mr. Snelling, 159 South street, New York, is the inventor.

MARINE REVIEW.

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

Chicago Office, Western Union Building, 110 LaSalle Street.
Published every Thursday at No. 516 Perry-Payne Building, Cleveland, O.

SUBSCRIPTION—$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department contain the names of 3,657 vessels, of1,183,582.55 gross tons register in the lake trade. In classification of this fleet the lakes have more steam vessels of 1,000 to 2,500 tons than the combined ownership of this class of vessels in all other sections of the country. The number of steam vessels of 1,000 to 2,500 tons on the lakes on June 30, 1892, was 321 and their aggregate gross tonnage 534,490.27; in all other parts of the country the number of this class of vessels was, on the same date, 217 and their gross tonnage 321,784.64. The classification of the entire lake fleet is as follows:

Class.	Number.	Tonnage.
Steam vessels	1,631	763,063.32
Sailing vessels	1,226	319,617.61
Canal boats	731	75,580 50
Barges	69	25,321.12
Total	3,657	1,183,582.55

Tonnage built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	No. of boats.	Net Tonnage.
1888	222	101,102.87
1889	225	107,080.30
1890	218	108,515.00
1891	204	111,856.45
1892	169	45,168.98
Total	1,038	473,723.60

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

	St. Mary's Falls Canal.			Suez Canal.		
	1892.	1891.	1890.	1892.	1891.	1890.
No. vessel passages	12,580	10,191	10,557	3,559	4,207	3,389
Ton'ge, net regist'd	10,647,203	8,400,685	8,454,435	7,712,028	8,698,777	6,890,014
Days of navigation..	223	225	228	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

IN ONE of the Duluth daily papers there appeared, a few days ago, an interview with Capt. Alex. McDougall of the American Steel Barge Company, in which reference was made to the publication in the REVIEW of specifications and illustrations accompanying all letters patent granted in this country to the inventor of the now famous whaleback barges, since the first patent on this type of vessel was taken out a few years ago. Capt. McDougall is quoted as saying that the series of articles referred to are published "in the interest of some people in Detroit, who brought to New York bankers and attorneys pictures of French whalebacks built twenty years ago, and who are apparently envious of the barge company." It would be a most difficult task to publish a newspaper that would please everybody. Still, it will always be the aim of this journal to refrain from seriously offending anyone, though this policy of seeking favor and patronage may sometimes prevent the publication of legitimate news. In the present instance we see no good cause for an apology, as the matter in question has long since been public property, but the occasion leads us to remark in all candor and earnestness that there is no ship building company, vessel owner or shipper who can dictate a single line to appear in the REVIEW in the interest of any individual or corporation or to the disadvantage of anyone connected with the business of the lakes.

WITHIN the past few days meetings have been held in different parts of the lakes that would indicate an effort to create discontent on the part of men employed on the vessels. There is certainly no cause for paying any attention to agitation of the question of wages at this time, and if the men give heed to the disturbers they are bound to meet with disappointment. Before contract freight rates were fixed a week or two ago, the Lake Carriers' Association adopted last year's opening schedule of wages, which is now being paid on all the vessels of that association, representing practically the entire lake fleet. Since the adoption of this schedule, however, an unexpected depression has come over the transportation business of the lakes. Contract rates on iron ore are fully 20 per cent. lower than they were a year ago, and although it is not generally known, there has been a minority effort in the association to reduce wages. A conservative feeling has ruled thus far, however, and it is to be hoped that the freight market will improve so as to not require a reduction. Under such circumstances any undue prominence to the question of wages on the part of the men is certainly ill-advised.

IF the elaborate preparations being made at Chicago for a grand gathering of costly and elegant yachts at the World's Columbian Exposition are carried out on the scale indicated in a letter elsewhere in this issue from Commodore Robert Rea, the distinguished lawyer who is so well known on the lakes, there will be a demand before long for more floating palaces like the Wadena, Comanche, Peerless, Say When, Truant and other steel steam yachts that cost about as much as a modern freight carrier. The movement for a naval accademy and yachting headquarters at Chicago will be the nucleus for creating a great interest in yachting on the lakes, and should be helped along by ship builders as well as the yacht owners of Detroit, Toledo, Cleveland and other lake cities.

IT would seem as though the plans for holding an international conference to reform maritime signals are to meet with success. The powers that have given approval to the project are Great Britain, France, Austria-Hungary, Spain, Brazil and the United States.

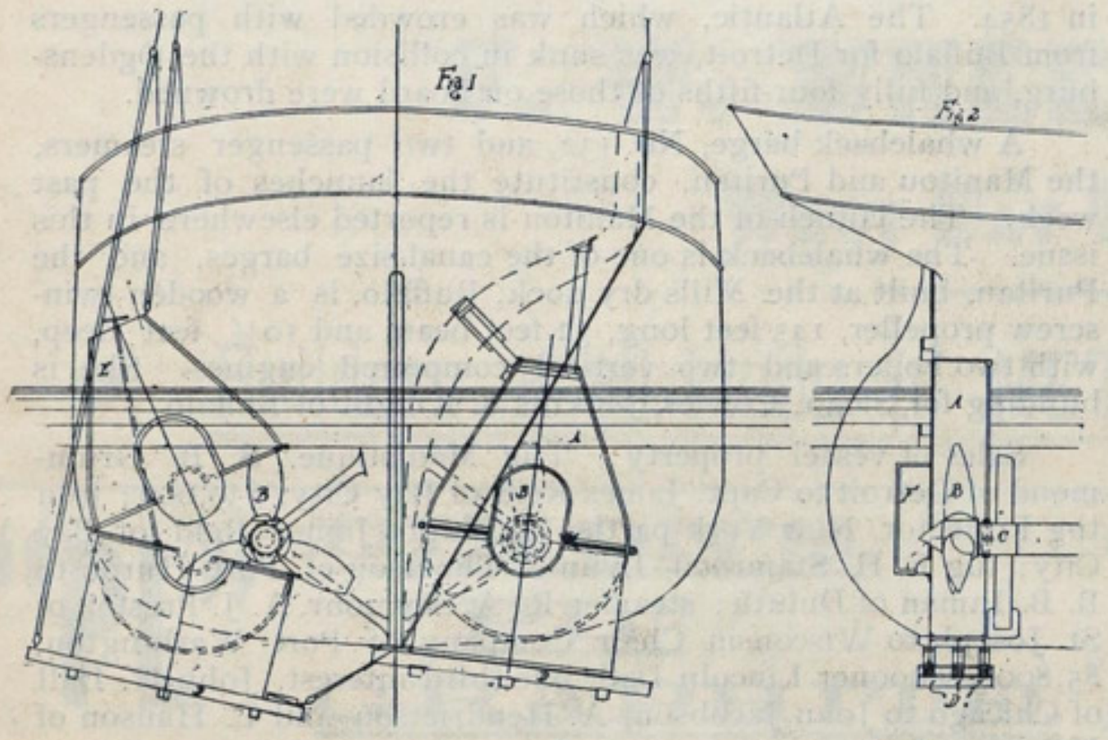
Fire from Electric Light Equipment.

Although it is probable that the cargo underwriters, and not the owners of the steamer Selwyn Eddy, will be held liable for the damaged cargo of oats delivered at Buffalo last week, the accident, resulting from the electric lighting equipment, brings up a question that is new to the lakes and may require considerrble attention from vessel owners. The whole cargo was so smoked that about 10 cents a bushel is to be taken from its previous value. It is expected that within a few days a full report will be made of the accident by the inspectors, but as yet the only reliable information regarding it is contained in the following statement to Brown & Co., Buffalo agents of the vessel, by Frank Kitton an electrical expert:

"Having been called upon by yourselves, and the owners of the cargo of the Selwyn Eddy, as an electrical expert, to examine the electric light equipment in that vessel and to state the probable cause of the fires which occurred during her recent trip, I would respectfully report that I find the electric wiring to be in a good and safe condition; that there is evidence of three fires having started in the hold of that vessel, and in each case these fires were in the immediate location of an electric light. In two cases the fire had made such headway as to leave the wires, and moulding containing the wires, in such a condition as to practically render it impossible to determine the contributing cause. In the third instance the wires, etc. are intact, but the lamp itself is destroyed. This, and the general satisfactory condition of the wiring, leads me to the opinion that the lamps themselves, and not the wiring, were the cause of the fires, assuming that the fires arose from the use of the electric lights. On this assumption the following theory is advanced in explaining the origin of the fires: The hold was filled with grain to a point above and surrounding the lights, as indicated by a deposit of grain upon the moulding carrying the wires, which is higher than the lamps themselves, and the lamps were left burning after this condition existed. The heat developed by the lamps was sufficient, being confined by the cargo, to dry and finally carbonize the grain, in which condition it became highly inflammable and was readily ignited in some manner not definitely known."

Cofferdams for Work on Propellers.

Although dry docks capable of taking in the largest vessels on the lakes are now in operation at half a dozen ports, it is probable that the cofferdam system of examining, putting on or taking off propellers, which was recently given a trial on the big American line steamer City of New York, might be followed in some cases to advantage here. The device for this work shown in the accompanying drawing is the invention of John Haug, a well known mechanical engineer and marine architect of 206 Walnut Place, Philadelphia. In the use of the apparatus on the big twin-screw Atlantic liners it is claimed that there is a great saving of delay and expense. The box A is of such shape as to surround the propeller B, centering itself upon the boss of the stern bearing braces C, and is sufficiently roomy to permit, when pumped out, of the inspection, repairing or replacing of the propeller. The box is in two parts, being opened, as shown on left side of the drawing, and closed again when central around the propeller, as shown on right side of same figure. To relieve the stern bearing brace of the strain caused by the displacement of the box, when pumped out, beams D D are fastened to its bottom which bear under the keel of the vessel by proper wedges, and



the top of the box can also be supported against the stern above water by struts, as shown. The box should be made of iron and wood in such proportions that it will float about submerged, when opened and ready for use, so that it can be easily handled and put over the propeller in the manner shown on the plan. When closed, the joints on the center line and around the stern bearing boss are made water tight by canvas pads fastened to the box, and it is forced together and closed by a pair of long screws E. When the box is pumped out, these screws can be taken out of the way, and the two parts fastened together by bolts through lugs put on the inside for that purpose, and any necessary work on the propeller can then be done. The recess F is put on, so that the propeller hub may be taken off and removed without uncoupling and drawing the shaft. The box can be used for both propellers by merely changing the bolts in the hinges. The engraving and description are from the Marine Journal of New York.

W. W. Lawrence & Co., paint and white lead manufacturers of Pittsburg, report among other large orders just received one from the United States navy yard, New York, for more than a thousand gallons of their Lawrence paints, ready mixed. The competition for this business is close and quality plays an important part, and it is no small compliment to the Lawrence paints and the manufacturers that so many departments of the government are using them.

A few copies of Patterson's Nautical Dictionary held by the MARINE REVIEW are all that are for sale anywhere, since the destruction by fire of plates and all other material entering into the work. The price, $5, has not been raised.

Iron Mining.

VALUE OF LEADING STOCKS.

Quoted by Chas. H. Potter & Co., No. 104 Superior St. Cleveland, O.

Stocks.	Par Value.	Bid.	Asked.
Cleveland-Cliffs Iron Company	$100 00	$.....	$.....
Champion Iron Company	25 00	28 00	.....
Chandler Iron Company	25 00	.....	40 00
Jackson Iron Company	25 00	.....	75 00
Lake Superior Iron Company	25 00	31 00	.....
Minnesota Iron Company	100 00	.....	63 00
Pittsburgh & Lake Angeline Iron Co.	25 00	.....	140 00
Republic Iron Company	25 00	.....	9 75
Ashland	25 00	.....	.....
Section Thirty-three	25 00	1 00	.....
Brotherton	25 00	2 00	2 50
Iron Belt	25 00	2 40	2 75
Aurora	25 00	6 50	7 00

Investment brokers, bank cashiers and others in Cleveland, who have for years manifested considerable interest in Lake Superior mining stocks, no longer give more than passing attention to them. Among a few holders of the old line of stocks, and a few dealers in these securities, there is, of course, some interest in ore sales now being made, but the margin on present prices is so low as to cause even more depresion than the market for stocks has shown during the past several months. There is some demand for shares of the Minnesota, Lake Superior and Lake Angeline companies, the latter being expected to pay this year dividends about equal to the total of $20 a share paid last year, but even in the case of these most desirable stocks the close money market is against active trading. Certainly some of the standard securities should be a purchase at present prices. As yet the Missabe stocks have not found favor among general traders in Cleveland, Milwaukee or Chicago and it is not probable that any great amount of trading in them outside of controlling owners can be built up as long as there is a surplus of production as at present. Reports from Duluth indicate very low prices and few sales.

The contract for stripping the Adams mining property on the Messabi range has been awarded to Drake, Stratton & Co., of Pittsburg and Cleveland. It is the biggest contract of its kind yet awarded on the Messabi range, and calls for the removal of 60,000 yards of earth by August 15, and 40,000 yards before the end of the shipping season. One hundred thousand more yards are to be removed next spring, making the total 200,000 yards. —Vermillion Iron Journal.

At the Chapin mine a few days ago, 3,200 tons of ore were hoisted in twenty-four hours and the work was said to have surpassed all previous records for a like amount of time. It is now announced, however, that on July 12 last 6,800 tons were raised at the Norrie in a single day.

Only ten mines of the Gogebic range have as yet begun shipments from Ashland, as against twenty-four mines a year ago.

Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on May 20, 1893:

	Wheat, bu.	Corn, bu.
Chicago	19,877,000	1,134,000
Duluth	12,200,000	256,000
Milwaukee	1,346,000	9,000
Detroit	1,382,000	14,000
Toledo	2,567,000	113,000
Buffalo	4,261,000	750,000
Total	41,633,000	2,276,000

At the points named there is a net decrease for the week of 2,772,000 bushels of wheat and a decrease of 757,000 bushels of corn.

Mr. Richard Thew, owner of the steamer W. P. Thew, ordered a No. 6 Worthington independent condenser, 7½ x 8½ x 10, from W. D. Kearfott, Worthington's Cleveland sales agent, Monday afternoon at 5 o'clock, and at the same hour Tuesday another machine that had been used was landed and the new one was in the boat.

The name of Lord Dunraven's 20-rater, most prominently mentioned in connection with the great international yacht race, is Dierdre—pronounced Dire-dree.

Distinguished Gathering at a Launch.

WESTERN OFFICE, MARINE REVIEW,
No. 13 Western Union Building, CHICAGO, Ill., May 25.

Vice President A. E. Stevenson was a guest of the Lake Michigan and Lake Superior line at the launch of the new steamer Manitou, at South Chicago. He formed one of the party gotten up by Judge W. L. Ewing, and was a passenger on the new steamer Arthur Orr, which was chartered by the company to convey the guests to the scene of the launch. In fact the party of over two thousand people, who went down to South Chicago on the Orr, was the most representative crowd of people ever witnessing a launch at a ship yard on the great lakes, and was composed of some of the best people in Chicago. The plans of the Lake Superior line were crowned with great success throughout. Realizing the importance of the change in Lake Superior tourist travel by the placing of a steamer of the magnificence of the Manitou on that route, the plans for the launch, the birth of the new steamer, were conceived on a magnificent scale and the efforts of the owners were rewarded beyond their highest expectations. Many hundred invitations were sent to the most prominent people in the city, and the Arthur Orr, with a capacity of 2,500 passengers, was chartered to convey the guests to the yards of the Chicago Ship Building Company on the Calumet. When the acceptances began to pour in it was seen that theOrr would not be sufficient to accommodate the vast throng, and the Adrienne was obtained to carry those who should miss the Orr. The day was perfect, the sun shining warmly, and a shore breeze made the lake ride enjoyable. The Orr was rapidly filled, as was the Adrienne and many were taken on the Goodrich steamer Atlantic.

Miss Florence Higinbotham, daughter of the president of the World's Columbian Exposition, accepted the honor of breaking the bottle of champagne over the bows of the new steamer. Simultaneously with the crash of the bottle and the spraying of the wine, the Manitou began to move, and slid easily into the slip. No accident marred the occasion, which was witnessed by fully 10,000 people, many coming by train from the city.

The Manitou will go into commission about July 1. All the machinery is in place, and a great part of the upper works. The interior finishing composes most of the work yet to be done. The boat has already been fully described in the REVIEW.

The rise in Chicago grain freights from 1 cent all around to 1½ on wheat and 1⅜ on corn to Buffalo during the past week is not due to any great demand for tonnage, and must not be depended upon to advance ore rates.

Canadian Miscellany.

Special Correspondence to the MARINE REVIEW.

KINGSTON, Ont., May 25.—The customs officers have been notified that the government requires an entry to be made of all repairs to Canadian vessels executed in ports of the United States or other foreign ports. If the repairs were necessary no duty will be levied, but if made simply because they could be done cheaper than in Canada, duty will be collected according to the cost of the work. If the government added that all supplies of tackle, etc., must be reported, the Canadian ship chandlers would rejoice. Another order has been issued that claims for drawbacks are only valid in the case of new vessels and must be made within six months after registration. No person is entitled to receive a drawback except the builder or his assignees and the person for whom the vessel was originally built. The rebate applies to either sail or steam vessels, but not to scows or barges.

Among the applications for incorporation by letters patent is the International Navigation Company, Limited, with Toronto as chief place of business, and a proposed capital of $1,000,000. The applicants are Hon. Mr. McKindsey,Toronto; Alexander Manning,Toronto; E.Blos Parsons,Cornelius Vancotte, Charles S. Upton, of New York; Solomon Sylvester, James T. Matthews, Toronto; Warren Toby, Collinwood; Alexander E. Wallace, Leslie Mellen, Thomas Myers, Peter Ryan, Joseph Power, George Verral, John Knox Leslie, Alexander F. Webster, Joseph Lester Nichols, John Leckie, Benjamin Tripp, Frederick Roper, James Beaty, Sylvester Sharp, all of Toronto, and others. This is the opposition line to the Richelieu and Ontario Navigation Company.

Messrs. M. Beatty & Sons of Welland, will construct a dredge for the Dominion Government for use in connection with the Trent valley canal. It will cost $6,000.

Messrs. Gillies & Co., Carleton Place, will construct a steam yacht to be used as a tender for the revenue cutter Constance. The launch will be of light draught and will be used in chasing smugglers in the Gulf of St. Lawrence, should they take, as they have frequently done, to shallow water where the cruiser could not follow. The yacht will have a speed of 10 or 12 knots.

Several of the papers are taking up the question of the imposition of duty of 10 per cent. on the hull and 15 per cent. on the machinery of new vessels and calling for its abolition. They do this in view of the way the duty can be avoided, as instanced by the Richelieu and Ontario Navigation Company registering its vessels, which were built at Baltimore, in Newfoundland, and entering them as British crafts, which are free of duty. The Hamilton Times seems sensible in its conclusions, for it urges the abolution of duties upon the materials used in the construction of vessels. The editor says: "Let the Canadian ship builder get his material without payment of duty and he wants no protection in the shape of a duty on ships."

Around the Lakes.

H. B. Earhart & Co. succeeds to the business of the late Capt. Samuel Shannon at Duluth.

Ed McWilliams is the name of a new barge soon to be added to the tow of the steamer Stafford; capacity 1,100,000 feet of lumber.

Underwriters offer for sale until June 1 the wreck of the schooner F. L. Danforth as it now lies in Miller's dry dock, Chicago.

It is reported that the American Steel Barge Company is to build at Superior a boat for excursion business between Buffalo and Niagara Falls.

On her last trip up the lakes, the steamer V. H. Ketchum, running light with the barge Becker in tow, made the run from Port Huron to Sault Ste. Marie, 285 miles, in less than twenty-seven hours.

Two more record breaking cargoes were loaded at Duluth during the past few days. The straightback steamer Selwyn Eddy took out 115,000 bushels of wheat on a draft of 14 feet 3 inches, and the W. H. Gilbert loaded 30,000 barrels of flour.

Charles Brandes, Sr., who died at Kewaunee, Wis, a few days ago, was perhaps the last survivor of the few persons saved from the wreck of the passenger steamer Atlantic on Lake Erie in 1854. The Atlantic, which was crowded with passengers from Buffalo for Detroit, was sunk in collision with the Ogdensburg, and fully four-fifths of those on board were drowned.

A whaleback barge, No. 132, and two passenger steamers, the Manitou and Puritan, constitute the launches of the past week. The launch of the Manitou is reported elsewhere in this issue. The whaleback is one of the canal-size barges, and the Puritan, built at the Mills dry dock, Buffalo, is a wooden twin-screw propeller, 145 feet long, 32 feet beam and 10½ feet deep, with two boilers and two vertical compound engines. She is building for Sloan, Cowles, Jenkins & Knight of Buffalo.

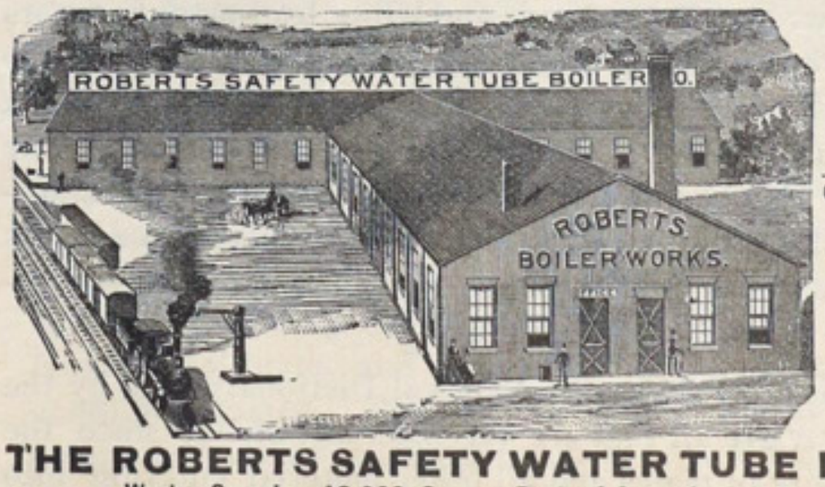
Sales of vessel property: Tug Manistique, S. B. Grummond of Detroit to Capt. James Reid of Bay City, $30,000; iron tug Protector, New York parties to Capt. James Reid of Bay City; tug F. H. Stamrood, Lynn & Thomson of Port Huron to B. B. Inman of Duluth; steamer R. A. Seymour, A. J. Preston of St. Joseph to Wisconsin Chair Company of Port Washington, $5,800; schooner Lincoln Dall, one-third interest, John H. Dall of Chicago to John Jacobson, A. Hendrictson and C. Hanson of Manistee, $1,250.

IN EFFECT MAY 28.—Remember that the new service on the Nickel Plate road goes into effect May 28th. Through trains between New York, Boston and Chicago. No change of sleeping cars. Superb dining cars. Three fast trains in each direction daily.

FACILITIES FOR TRAVELERS. — The Nickel Plate road offers superior facilities to the traveling public, the improved service taking effect May 28th. No change of sleeping cars between New York, Boston and Chicago in either direction. Superb dining cars between Buffalo and Chicago in both directions. Trains leave Buffalo 5:50 A M., 12:05 noon, 11:25 P.M. Trains leave Chicago 7:35 A.M., 2:30 P.M., 9:30 P.M. All trains run seven days a week.

U S. ENGINEER OFFICE, 34 West Congress Street, Detroit, Mich. May 11,1893. Sealed proposals for dredging at "the elbow" in Lake Grorge, Saint Mary's River, Michigan, will be received at this office until 2 p. m., June 10, 1893, and then will be publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office. O. M. POE, Colonel, Corps of Engineers, &c. 11-18-25-1

The Roberts Safety Water Tube Marine Boiler



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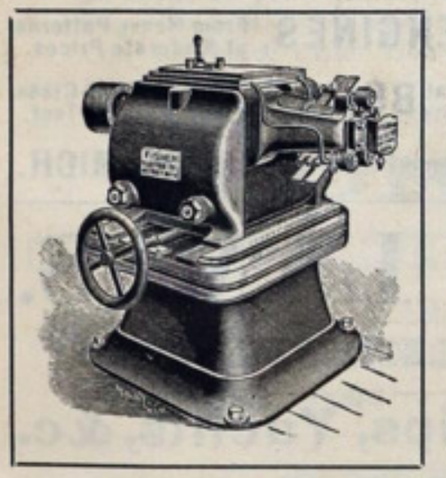

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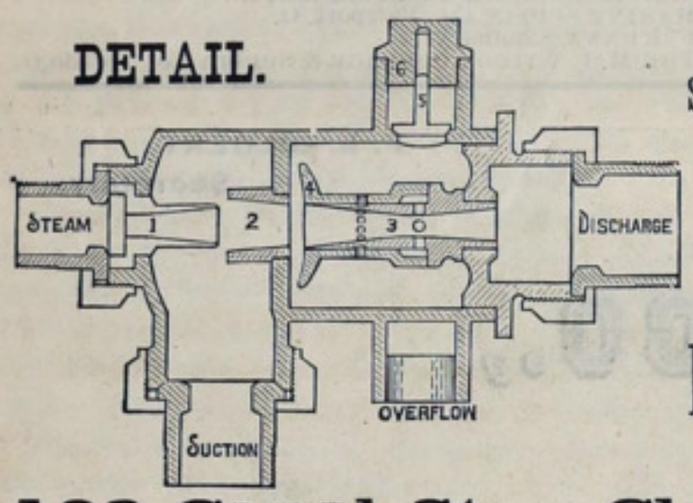

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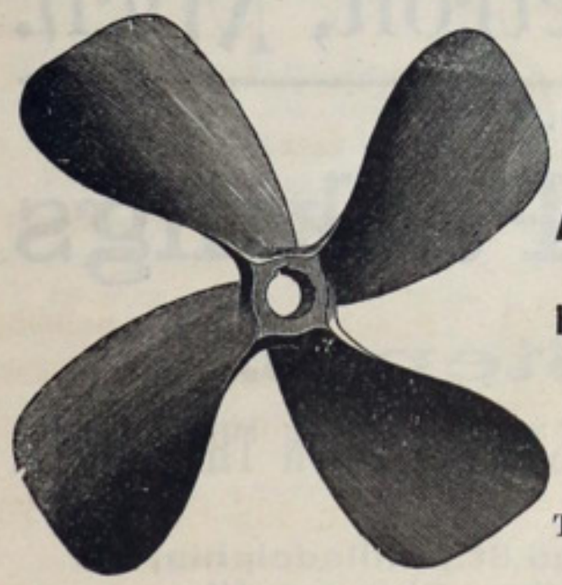

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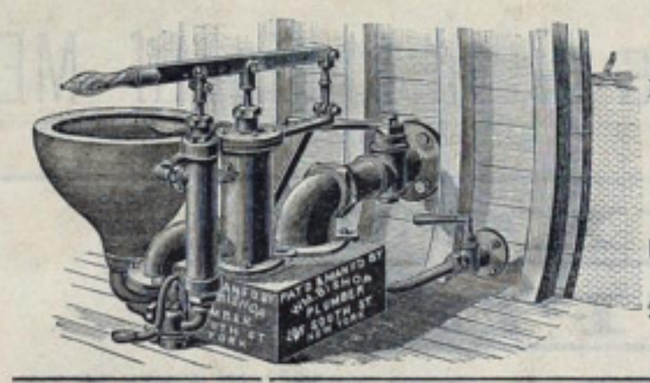

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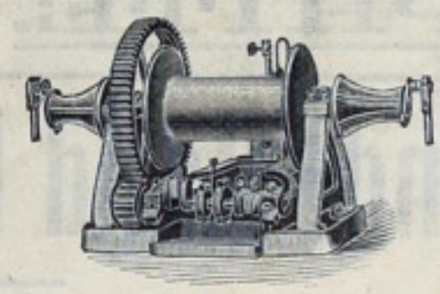

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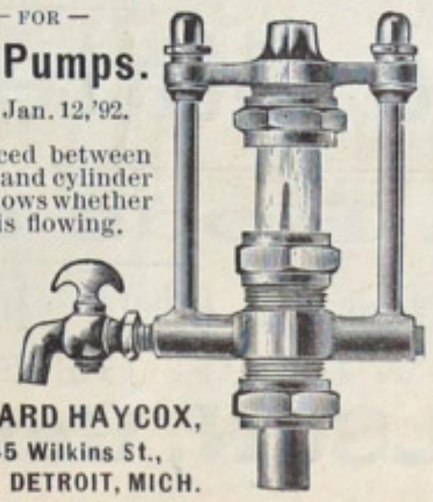

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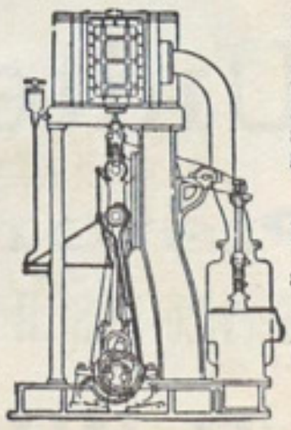

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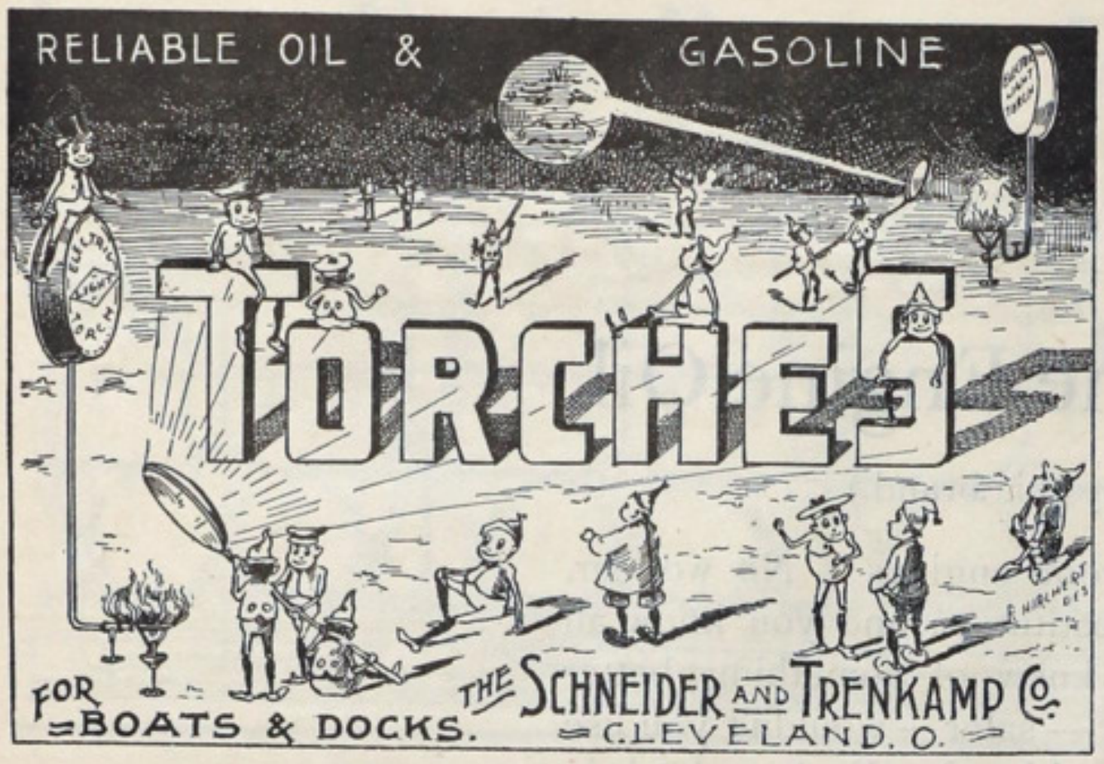

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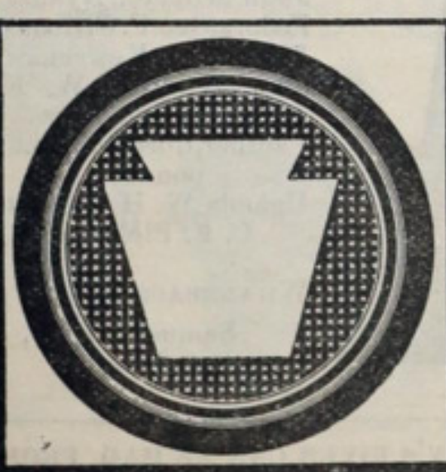

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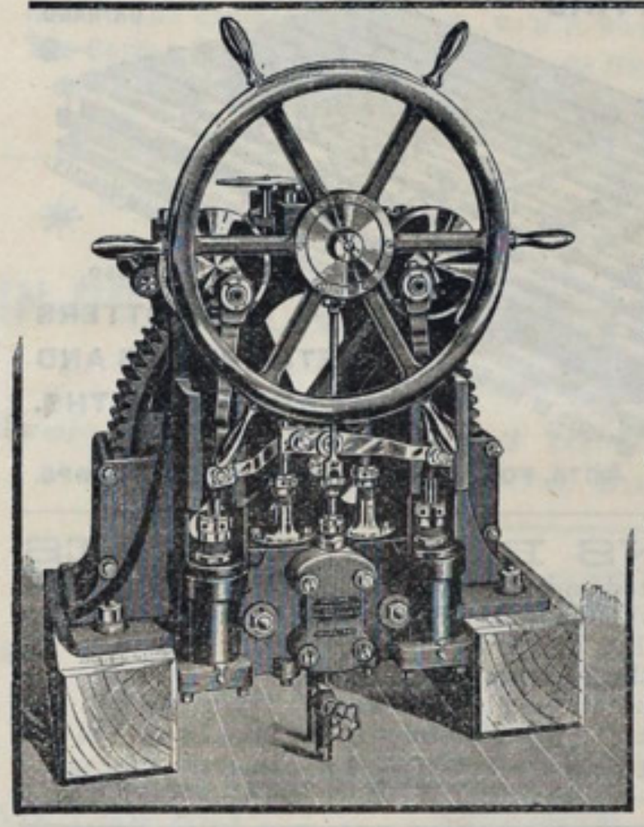

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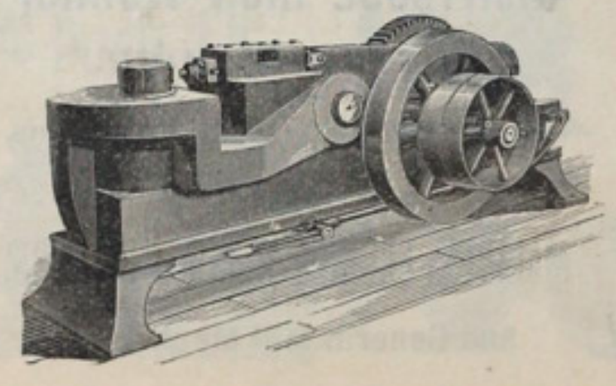

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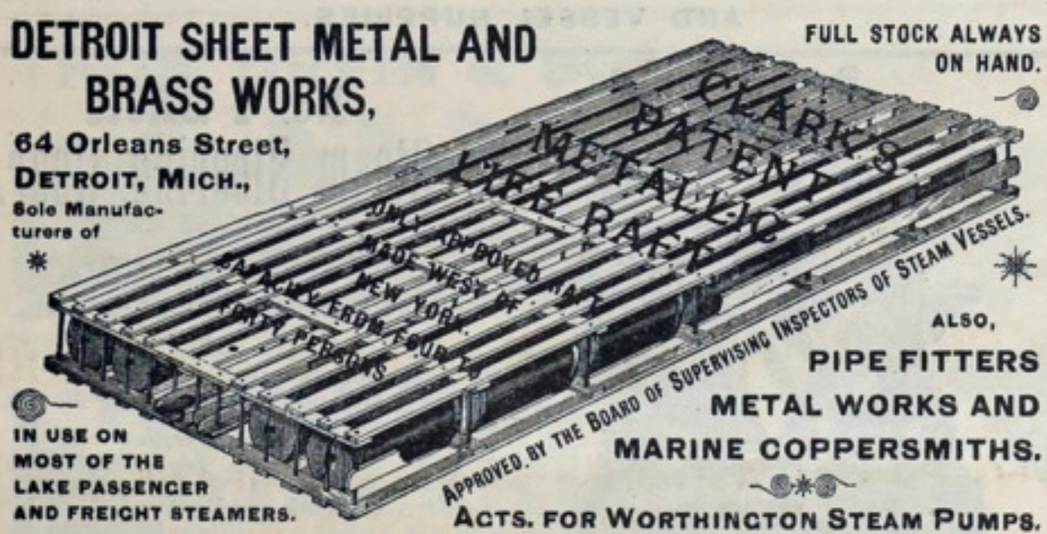
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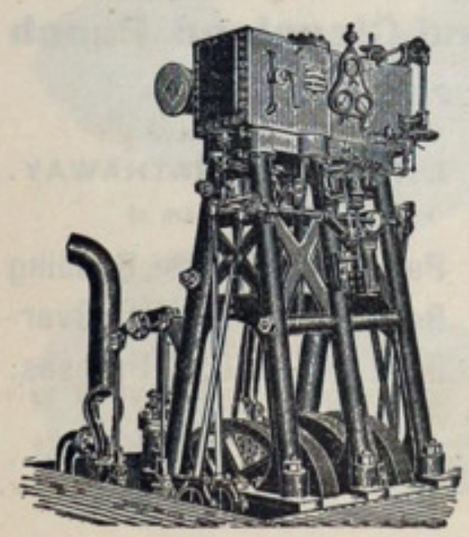

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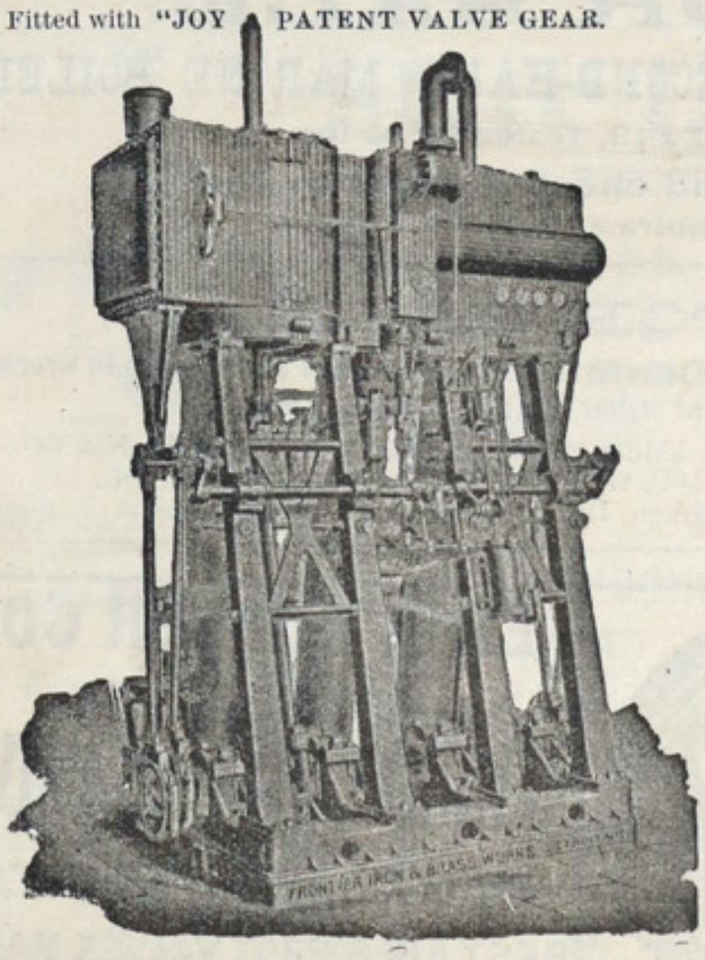

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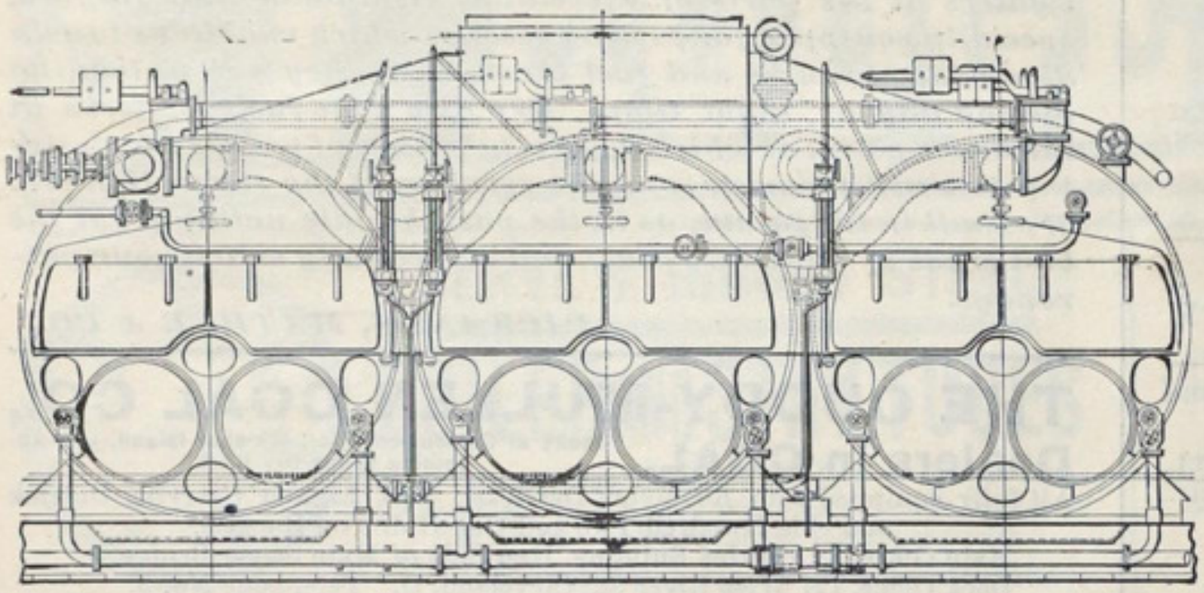

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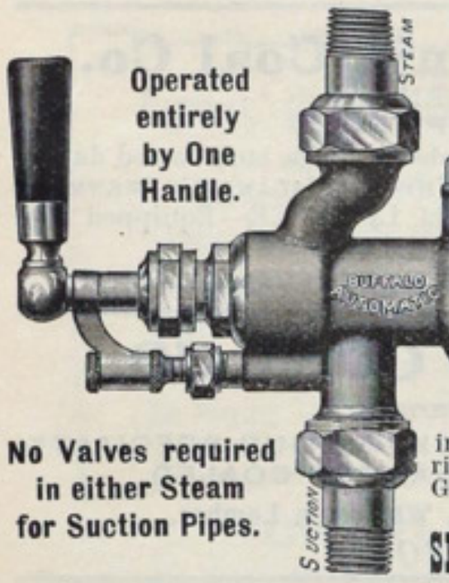

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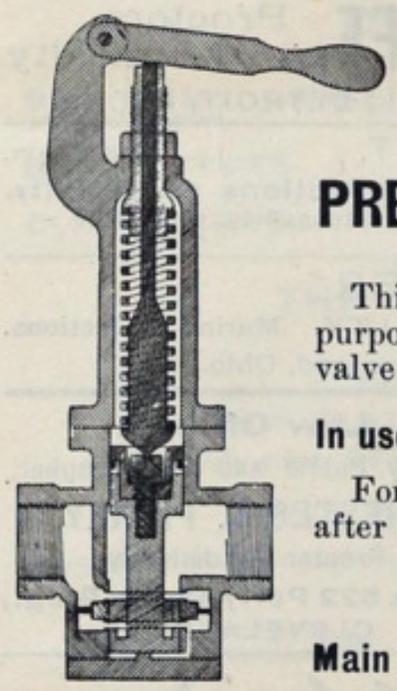

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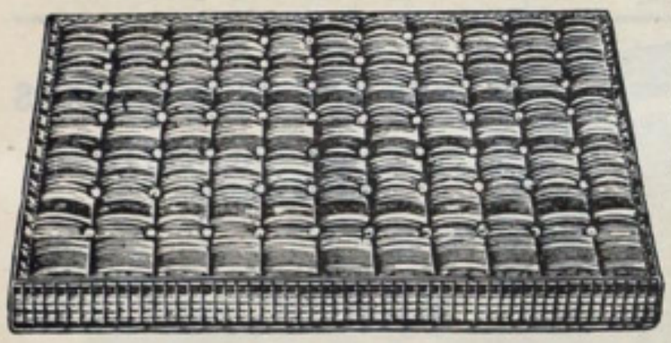

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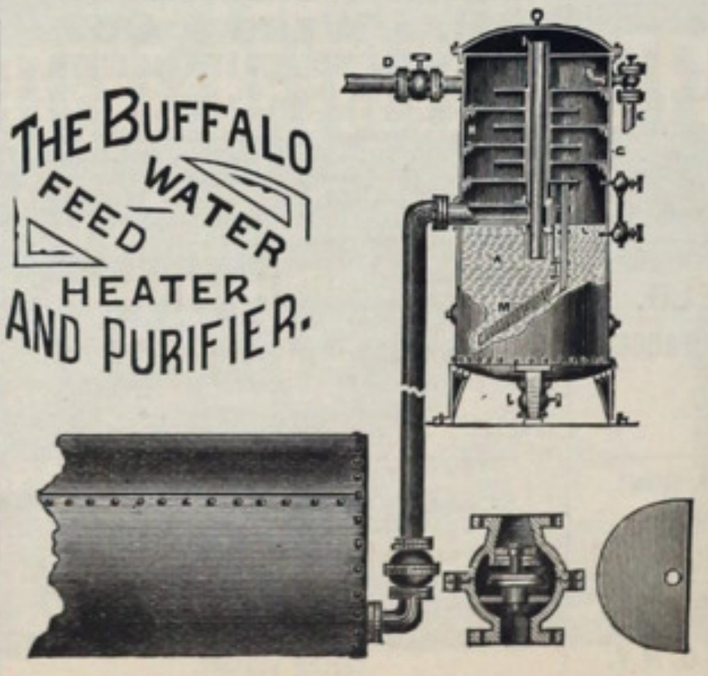

REFERENCES.

A.—Settling chamber.
B.—Boiler.
C.—Feed pipe to boil
D.—Steam pipe.
E.—Water supply pipe.
F.—Check valve.
G.—Spray disks.
H.—Spray chamber.
I.—Equalizing tube.
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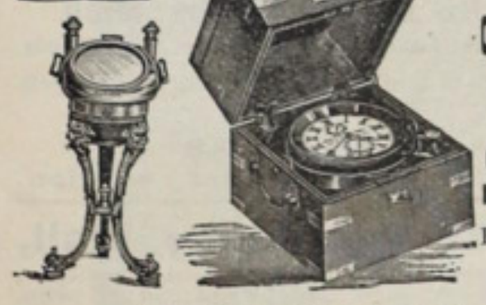

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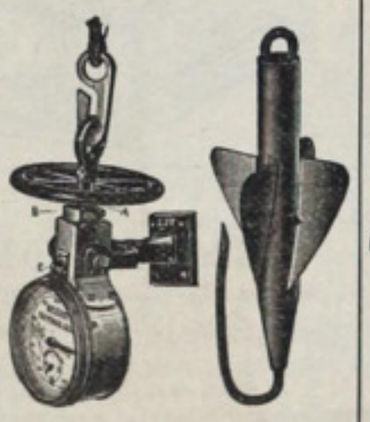

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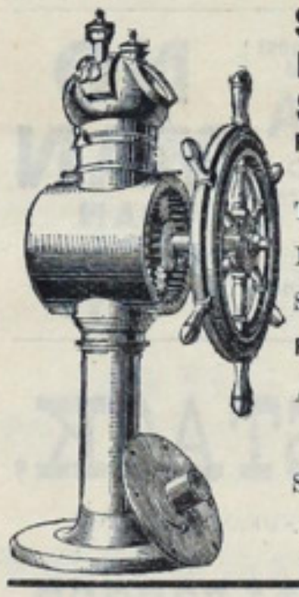

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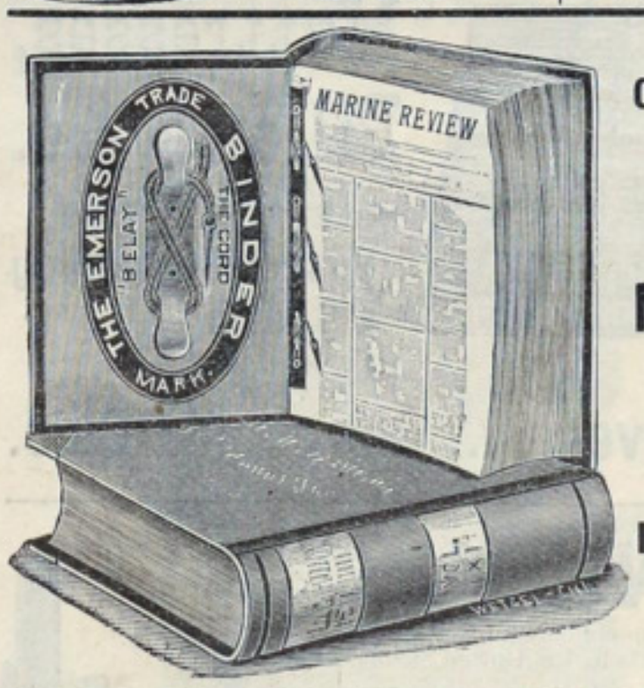

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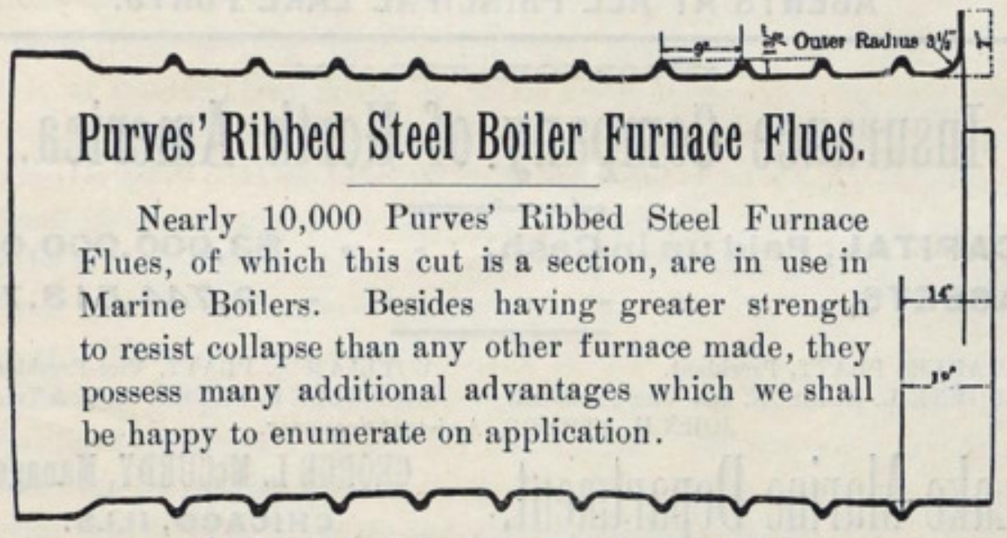

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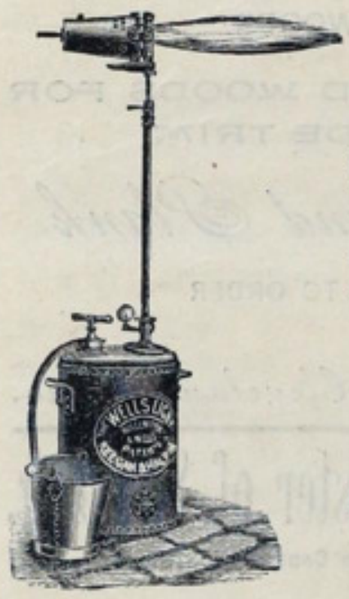

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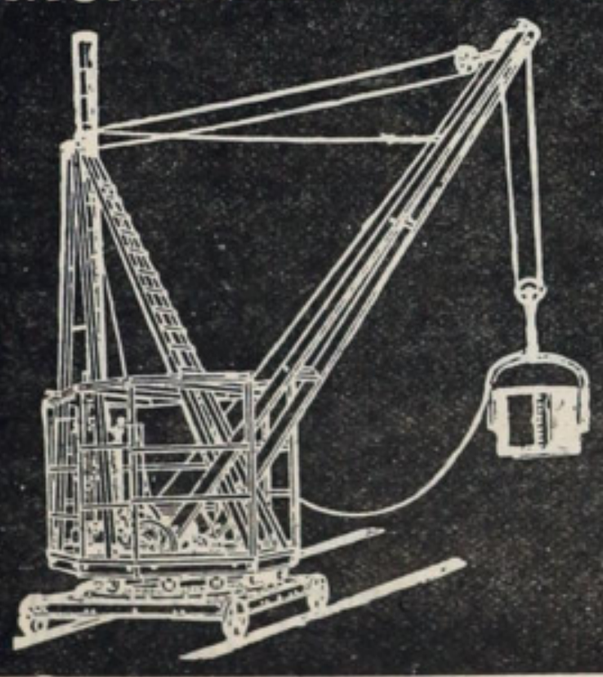

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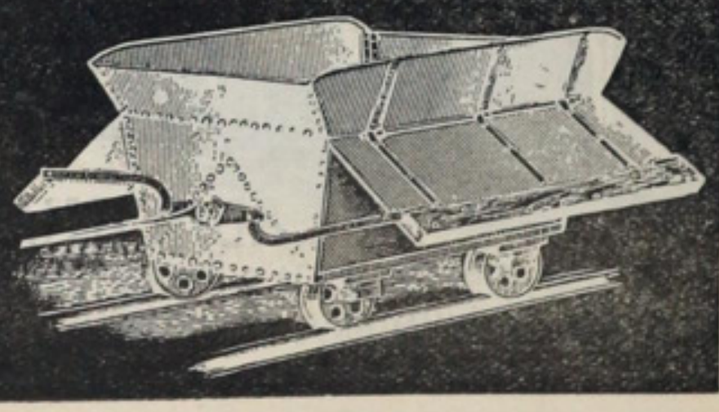

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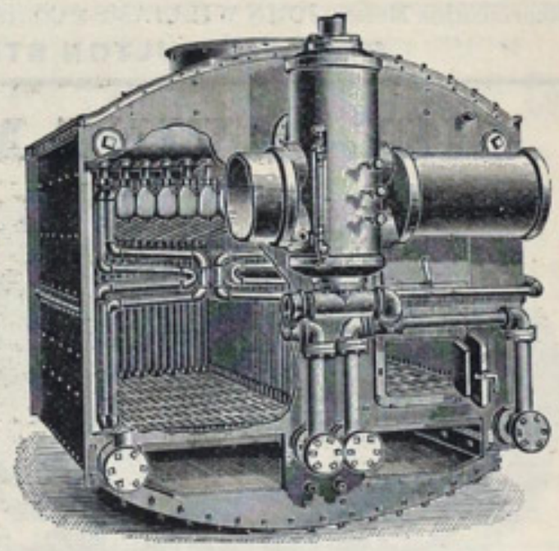

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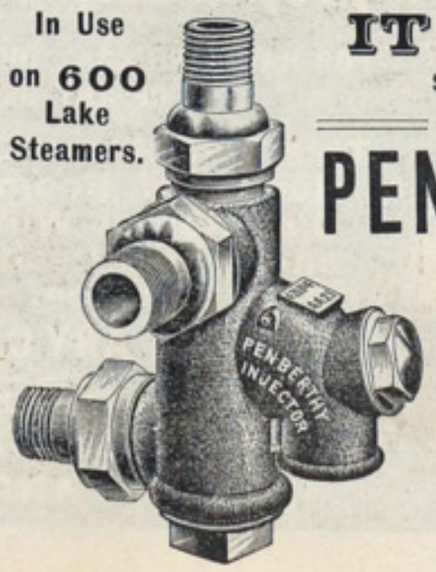

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